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EER/SEER As Indicators Of Cooling Efficiency

California Building Energy Efficiency Standards

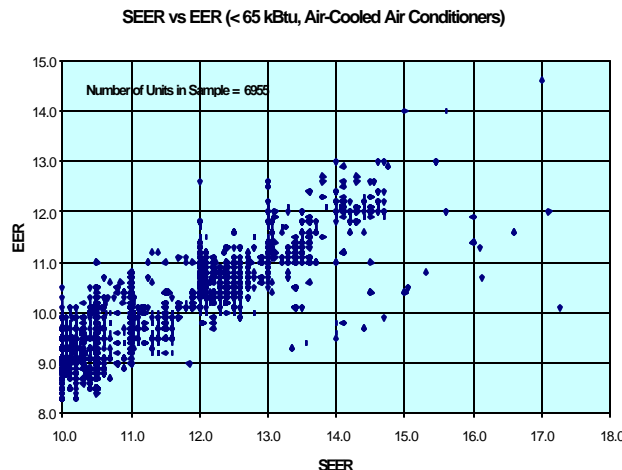
Revisions for July 2003 Adoption

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Description

The air conditioning industry has long relied on EER and SEER as indicators of cooling HVAC equipment efficiency and performance. All unitary air conditioners are rated using EER, a rating standardized by ARI, which reports steady-state efficiency at 95F outdoor and 80F indoor temperature. Smaller air-conditioners (i.e., < 65,000 Btuh) are also rated using SEER, a rating developed by the U.S. DOE and based on EER, intended to better indicate average seasonal performance, i.e., a season "average" EER. The current standards mandate air conditioner efficiency levels using EER and SEER and consumers are typically guided to make energy-wise purchases based on these ratings, e.g., "Consumers can compare the efficiency of central air conditioners and heat pumps (in the cooling cycle) using the SEER. The higher the SEER, the more efficient the unit..." (source: CEC web site).

Unfortunately, the steady-state procedures used to rate cooling equipment are insensitive to dynamic load (i.e., part-load) and off-rated temperature effects. Understandably, manufacturers design their units to maximize efficiency ratings. The figure below plots EER vs. SEER for approximately 7000 smaller cooling units (< 65,000 Btuh) included in the CEC's listing of certified air conditioners. Note that for a given SEER level, there is a significant variation in EER (i.e., +/- 15%) and for a given EER level, there is an even more significant variation in SEER (i.e., +/- 25%).



This large amount of variation results from the varied means manufacturers use to obtain the highest possible SEER rating. It follows that these same units will exhibit a great deal of variation in season-long performance under dynamic load and temperature effects.

This raises a concern that these steady-state efficiency ratings may not provide a reliable indication of seasonal performance. The key question becomes, can EER and SEER ratings alone accurately guide the consumer or specifier to make energy-wise equipment selections and do they serve as an adequate regulatory basis for Title 20 and Title 24? Perhaps different or additional rating and performance data should be required to more reliably indicate true season-long performance.

Southern California Edison is currently studying this concept to determine whether additional rating and performance data should be required to more reliably indicate true season-long performance.

Benefits

The principal benefit would be to allow the Standards to address climate-specific variations in equipment efficiency.

The effect of time-dependent valuation has not been determined.

Environmental Impact

No negative environmental impact is envisioned. Positive benefits may accrue due to reduced energy usage.

Type of Change

Prescriptive Requirement The change would add or modify a prescriptive requirement. Prescriptive requirements must be met for prescriptive compliance and define the Standards baseline building in performance calculations, but are not mandatory when the performance approach is used.

The proposed change modifies the existing scope of the standards, possibly developing new rating parameters for equipment.

This change could affect all documents, further study is required before the magnitude of the changes are determined.

Measure Availability and Cost

Further study is required before this topic can be addressed.

Useful Life, Persistence and Maintenance

Further study is required before this topic can be addressed.

Energy savings will be consistent over the life of the equipment.

Performance Verification

As this measure addresses packaged equipment, little or no additional field effort will be required to verify performance.

Cost Effectiveness

Cost savings will be generated as the study progresses.

Analysis Tools

This study utilizes the DOE-2.2 simulation program.

Relationship to Other Measures

No other measures are impacted by this change.

Bibliography and Other Research

Research is currently underway by SCE, with J. Hirsch & Associates as the lead contractor. Results will be within the time frame required for implementation in the Standards.